

that is used to tune a particular program offered over one of the hundreds of channels available from the cable system. The channel desired by the user is tuned using the primary tuner 202. If the television signal for that channel is an analog signal, it is then transmitted to the system bus 112 through an analog security circuit 111 for
5 descrambling the signal, if the signal is scrambled, and, though an optional encoder 110 for hardware assisted compression. If the set-top terminal 100 is intended to process and record only digital programming, as analog transmission is phased out, the analog security 111 and the encoder 110 as illustrated are no longer necessary. Although, the encoder 110 may be retained for encoding other analog signals from
10 alternate analog input sources for other applications.

[0017] The television programming received through the primary tuner 202 can be buffered and selectively recorded on the PVR disk 106 under the control of the central processing unit 104. This function is similar to that performed by the personal video recorders described above. The programming can also be decoded through the
15 audio/video decoder 103 and provided to the video/audio outputs 119. The user's television set (not shown) is connected to one or more of that set of outputs 119, thereby allowing the user to watch the selected programming.

[0018] Additionally, other data may be embedded in the television signal received through the primary tuner 202. This data may include, for example, an
20 HyperText Markup Language (HTML) file including a link with a universal resource locator (URL) that points to a web page associated with an advertisement, for example, being shown on the television channel to which the primary tuner 202 is tuned. The central processing unit 104 will preferably be running the necessary software to extract, display and record on the PVR disk 106 any such data. If the data
25 includes a universal resource locator (URL), the CPU 104 can access and record the file to which the URL points for subsequent review by the user. This can be done without interrupting the television programming the user is watching.

[0019] Moreover, one or more channels to which the primary tuner 202 can tune may be dedicated to providing one or more data transport streams. These data
30 transport streams can carry any type of data including any type of multi-media file, streamed audiovisual content or even application software, including player software

optionally capable of contents right management that can be stored on the PVR disk 106 and executed by the CPU 104.

[0020] As shown in Fig. 1, the set-top terminal 100 also preferably includes a secondary tuner 203 that is also connected to the cable television system 204. The secondary tuner 203 is used primarily to tune to the data transport stream within the signal from the cable television system 204 to free the primary tuner 202 for more conventional tuning of a television channel the user wishes to receive. This secondary tuner 203 may operate in accordance with any multiple access modems that facilitate bi-directional communication between the device and the headend, for example, the Data Over Cable Service Interface Specification (DOCSIS) standard being used in this embodiment to acquire digital data. When the tuned signal facilitates bi-directional communication, for example by use of a DOCSIS signal, communication with the Internet can be readily achieved so that web content may be retrievable for caching or storing in the set-top terminal 100. As previously stated, this data may include any type of multi-media content in a variety of formats. The data transport stream from the DOCSIS tuner 203 is provided to a DOCSIS modem 101. The DOCSIS modem 101 communicates with the CPU 104 over the system bus 112.

[0021] The second purpose of the secondary tuner 203 is to optionally allow for the respective recording and watching of separate audiovisual programming offered at two distinct frequencies, i.e., on different channels, or from different sources, i.e. streamed audiovisual content from the Internet and broadcast television programming. The secondary tuner 203 can also be used in conjunction with the primary tuner 202 to simultaneously watch two different television channels or audiovisual data streams in a picture-in-picture mode. Consequently, the two-tuner configuration allows for, *inter alia*, the following operating modes of interest:

- 1) Watching an analog channel, recording a digital program (encrypted or in the clear);
- 2) Watching a clear digital program and recording a digital program (encrypted or in the clear);
- 3) Watching an encrypted program and recording an analog channel or a second digital program in the clear; and

4) Watching picture-in-picture, where the first signal is received from the primary tuner while the second is played back or retrieved from the PVR disk 106.

[0022] When involving an encrypted MPEG-2 stream, the stream goes through the security device 102 for decryption first and then, if the decrypted signal is to be watched (instead of being recorded), it is processed by the decoder 103. The content may also be encrypted using alternate software assisted techniques in which a second decryptor may not be required.

[0023] Digital data, multimedia files and application software can also be transmitted to the set-top terminal over the cable television system on an out-of-band (OOB) control channel 117. Although for bandwidth capacity considerations, the in-band (primary tuner) or the secondary tuner are more suitable. An OOB data channel is utilized primarily to facilitate conditional access functions for traditional and emerging services offered by the cable system operator as described in the prior art.

[0024] However received, compressed audiovisual content may then be recorded on the PVR disk 106. If the audiovisual data is streamed, e.g. web-cast, recording that data on the disk 106 may be done for caching purposes (subsequent use by the application software on a dynamic basis) or permanently stored. Additionally, the audiovisual signal recorded on the disk 106 can be retrieved and processed through the audio/video decoder 103 and then provided to the video/audio outputs 119 of the set-top terminal 100. The user's television set (not shown) is connected to the video/audio outputs 119 and, consequently, receives the output signal so that the user can then watch the recorded audiovisual programming.

[0025] Additionally for bi-directional communication, an upstream transmitter 205 is provided in connection with the DOCSIS modem 101. The DOCSIS modem 101 incorporates an upstream processor that drives the transmitter 205 to facilitate upstream DOCSIS transmission, as well as, to support existing report-back protocols 101 used to manage the cable television system. The DOCSIS modem 101 thus provides bi-directional communication for Internet access, user requests of web pages, files, session requests, purchase requests, etc.

[0026] Control lines to the primary tuner 202 and the secondary DOCSIS tuner 203 are provided from the system bus 112. This allows the user to input tuning